



THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of : Confirmation No. 5987
Kazuo HATA et al. : Docket No. 2000_0776A
Serial No. 09/597,763 : Group Art Unit 1772
Filed June 20, 2000 : Examiner W. Watkins III

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**CERAMIC SHEET AND PROCESS FOR
PRODUCING THE SAME**

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TC 1700

Sir:

This is responsive to the Official Action dated July 5, 2002, the time for response being extended for two months in accordance with a petition for extension submitted concurrently herewith.

The Official Action constitutes a single ground of rejection.

Claims 1-7 are rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,733,499 to Takeuchi et al. This ground of rejection is respectfully traversed.

The Examiner takes the position that it would have been obvious to one of ordinary skill in the art that a surface roughness of less than .2 microns would limit burr and dimple heights to less than 100 microns because of the teachings of Takeuchi et al. that low surface defects are desired.

The inventors of the claimed invention respectfully disagree with the Examiner's position, in that the burr of the claimed invention and the surface roughness of Takeuchi et al. are directed to different features, resulting in different problems, requiring different solutions.

Takeuchi et al. mention that it has been difficult to make a product which hardly has surface defects. See column 1, lines 28-30 of Takeuchi. As pointed out by Takeuchi et al., the surface defects are caused by coarse aggregated particles and the like which are inevitably contained in a ceramic slurry. See column 1, lines 31-42 of Takeuchi. Also mentioned is that employing a doctor blade method for molding the sheet, which can be used in the claimed

invention, would scratch the surface of the sheet, thereby lowering surface smoothness. See column 5, line 63 to column 6, line 5 of Takeuchi. An object of Takeuchi et al. is to provide a ceramic sheet having less surface defects. See column 2, lines 1-7 of Takeuchi. According to Takeuchi et al., the surface defects are suppressed by controlling an average degree of aggregation of ceramic particles. See column 3, lines 58-65 of Takeuchi. Further, Takeuchi et al. discloses that the average degree of aggregation of ceramic particles can be controlled by filtering the ceramic slurry, thereby excluding aggregated particles from the ceramic slurry. See column 4, lines 44-54 of Takeuchi. That is, the surface defects of Takeuchi et al. mean defects caused by the aggregated particles, and the effect of Takeuchi et al. is to improve the surface smoothness itself. According to the example of Takeuchi et al., the number of defects larger than $10\mu\text{m}$ on the surface are counted. See column 8, lines 26-27 of Takeuchi. The surface defects of Takeuchi et al. means micro size defects or localized defects which can be counted.

On the other, the claimed invention points out that cracking and breakage may occur according to the degree of the stacking-induced load or thermal stress if the burr height and/or dimple height on the periphery of the sheet do not meet a certain condition. See page 3, lines 12-20 of the specification.

Therefore, an object of the claimed invention is to provide a ceramic sheet which exhibits less cracking or breakage even when a large stacking-induced load or thermal stress is applied. See page 9, lines 1-5 of the specification. According to the claimed invention, these problems are suppressed by controlling burr height and/or dimple height. See page 9, lines 6-9 of the specification. Further, the claimed invention teaches a method for controlling the burr height and/or dimple height by adjusting a punching step and a baking step. See page 10, lines 1-15. That is, the burrs of the claimed invention mean burrs caused by the punching. Accordingly, the burrs and dimple of the invention means changes in sheet shape (macro size defects) which is determined by overlooking a wide range of the sheet.

The burr height of the present invention means the difference in heights between the maximum point and the minimum point of the sheet in an area ranging from the peripheral edge of the sheet to 3mm inside the edge. The dimple of the present invention means a protrusion or a depression locally formed on the surface of a sheet. See page 9, lines 14-25. Roughness is calculated sheet surface value obtained by filtering a sheet shape factor which shows larger wave length than a certain wave length level as defined in ASME B46, 1-1995. Accordingly, the value

of the surface roughness does not reflect dimple height, burr height, waviness and warp. See Appendix A submitted herewith.

As discussed above, the surface defects of Takeuchi et al. and the burrs of the claimed invention are different from each other. Since the burrs and dimples are distortions of the sheet itself and the surface roughness is the irregularity of the convex portion of the sheet surface, the claimed invention is directed to solving a macro level defects of the sheet itself which is caused by the sheet forming process, whereas Takeuchi et al. is directed to solving micro level defects of the sheet surface which is caused by the raw material.

Furthermore, Takeuchi et al. teach that the surface defects can be suppressed by controlling the average aggregate degree of the ceramic particles, which can not solve the distortions of the sheet itself, such as the burrs caused by the punching or dimples caused by the baking. From the above, it is apparent that the cracking and breakage may occur according to the degree of the stacking-induced load or thermal stress, even if the surface roughness of the sheet is $0.2\mu\text{m}$ or lower, without satisfying the requirement of the present invention.

As discussed above, the claimed invention and Takeuchi et al. provide different methods for solving different problems from each other. It does not mean, as suggested by the Examiner, that lowering the surface defects as taught by Takeuchi et al. contributes to lower the distortion, such as burr height of the sheet or dimple height.

In summary, the claimed invention is directed to solving a different problem than taught by Takeuchi et al., which problem and solution are not disclosed or suggested by Takeuchi et al.

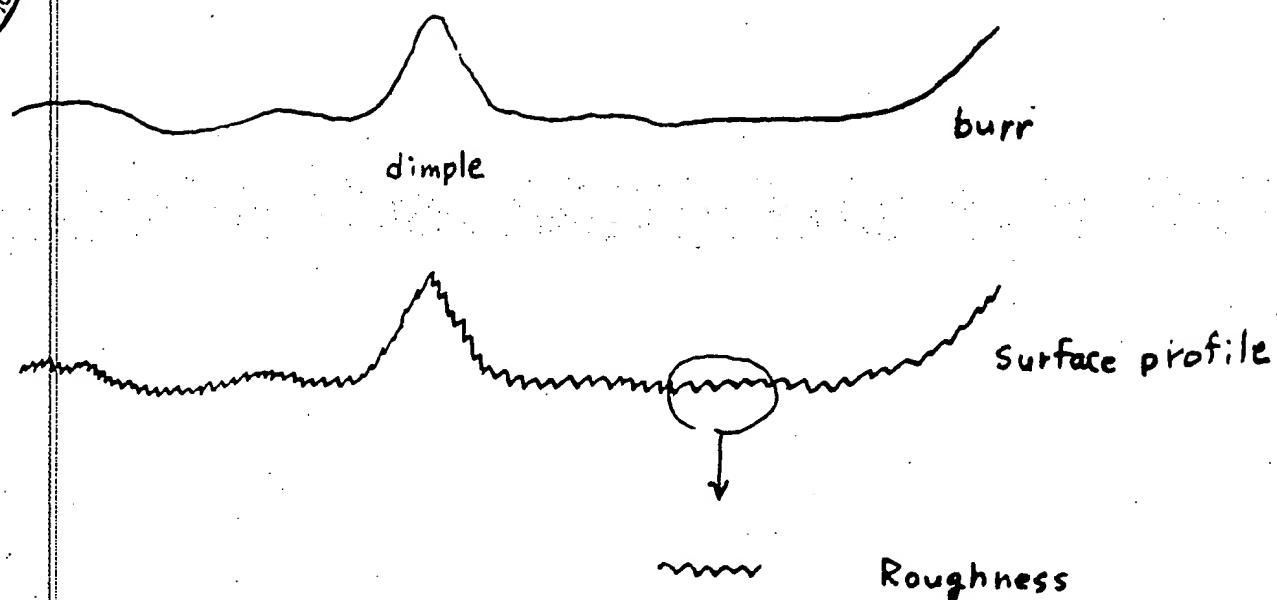
In view of the foregoing, favorable reconsideration and allowance is respectfully solicited.

Respectfully submitted,

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Appendix A

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